Figure 1: Overall Configuration
of SAN Infrastructure on Demand (SIoD) Service System

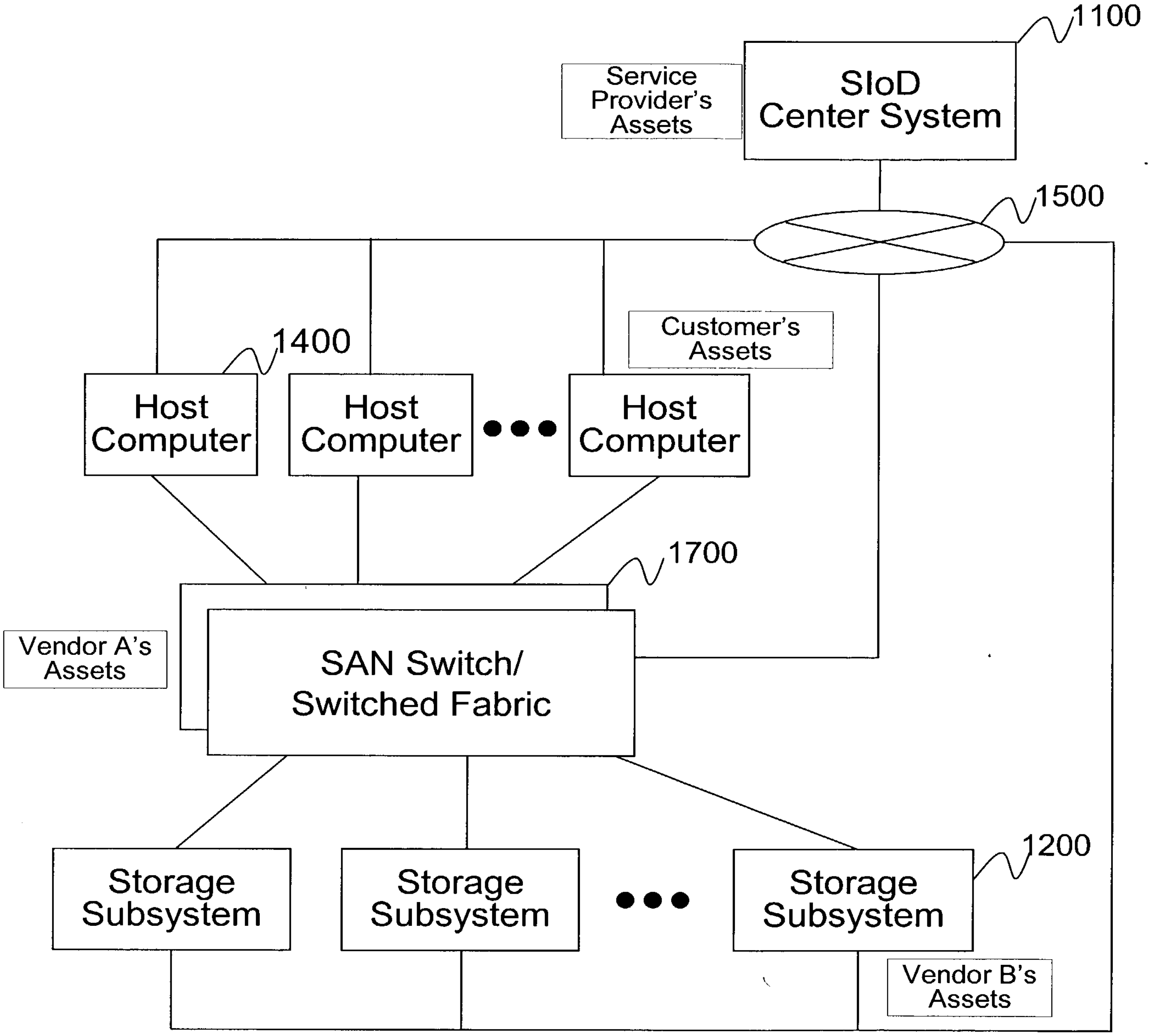

1100
Service Provider's Assets
SIoD Center System
1500
1400
Customer's Assets
Host Computer
Host Computer
Host Computer
1700
Vendor A's Assets
SAN Switch/ Switched Fabric
1200
Storage Subsystem
Storage Subsystem
Storage Subsystem
Vendor B's Assets

Figure 2: Configuration of SIoD Center System 1100

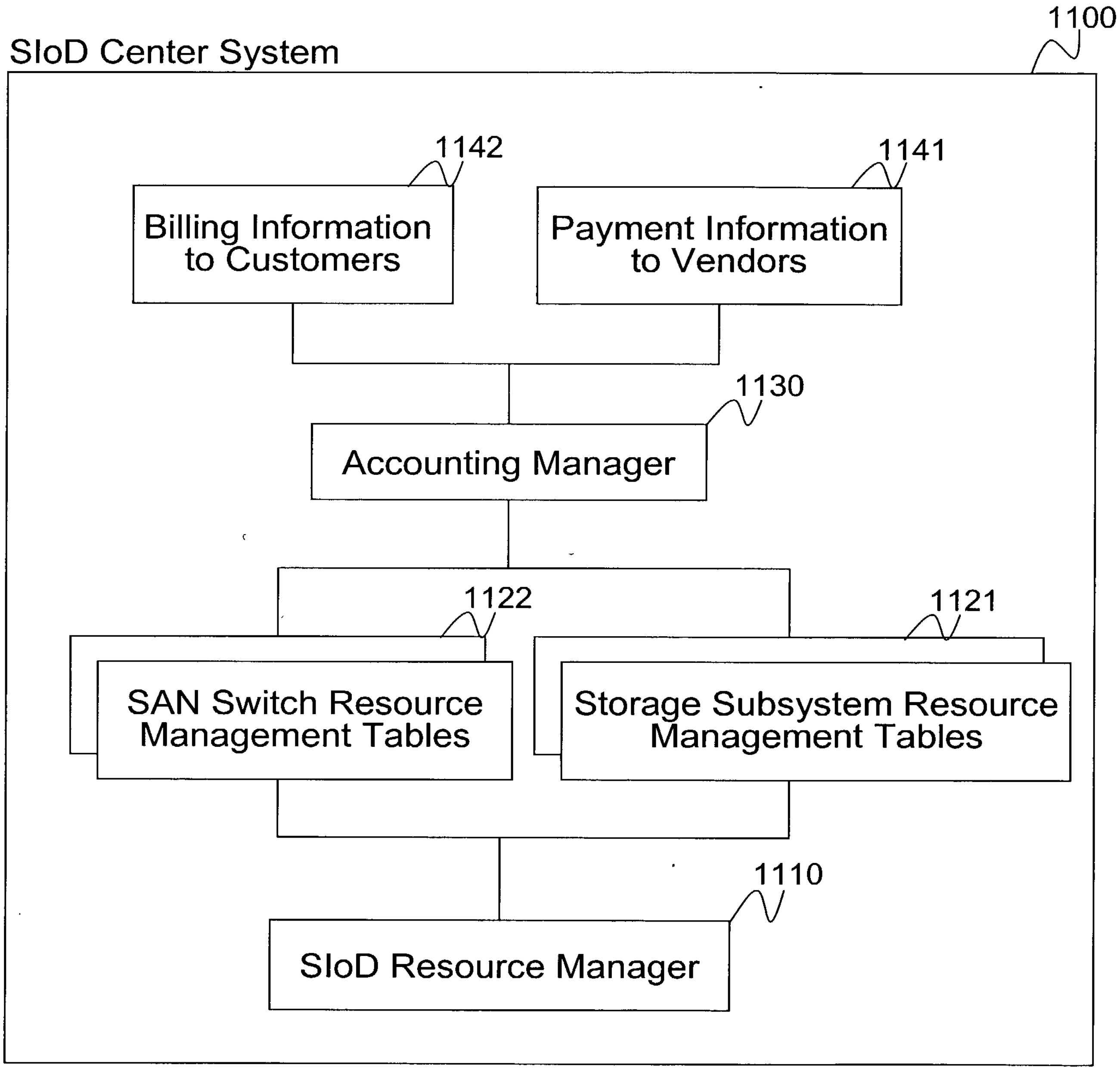

SIoD Center System
1100
1142
Billing Information to Customers
1141
Payment Information to Vendors
1130
Accounting Manager
1122
1121
SAN Switch Resource Management Tables
Storage Subsystem Resource Management Tables
1110
SIoD Resource Manager

Figure 3: Configuration of Host Computer 1400

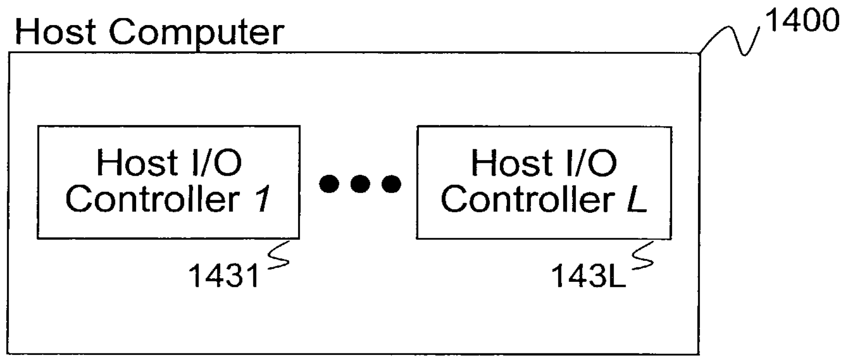

Host Computer
1400
Host I/O Controller *1*
Host I/O Controller *L*
1431
143L

Figure 4: Configuration of SAN Switch 1700

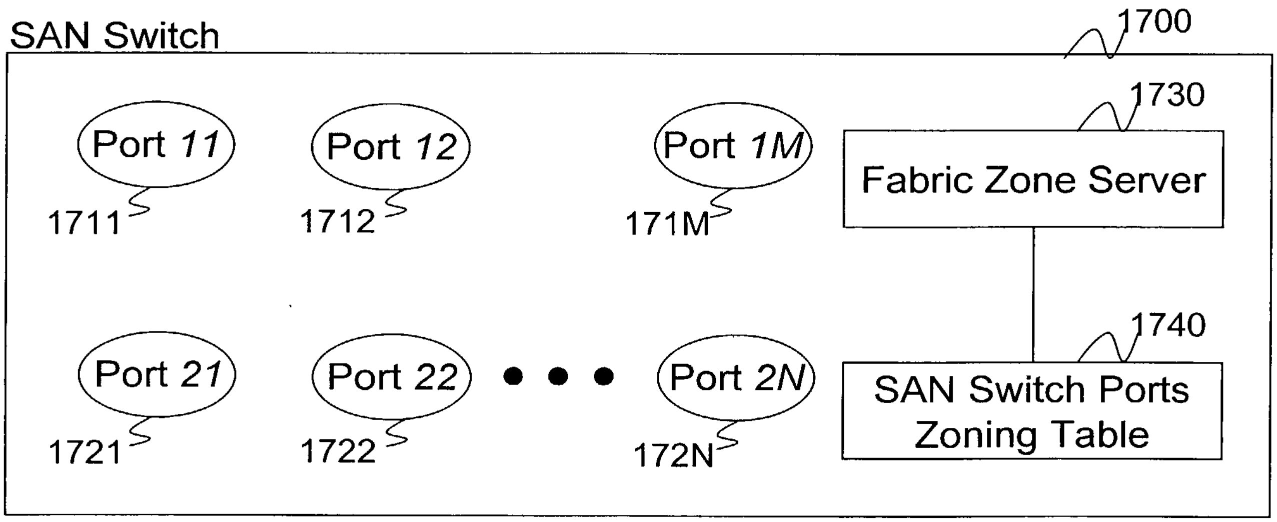

SAN Switch
1700
1730
Port *11*
Port *12*
Port *1M*
Fabric Zone Server
1711
1712
171M
1740
Port *21*
Port *22*
Port *2N*
SAN Switch Ports Zoning Table
1721
1722
172N

Figure 5: Configuration of Storage Subsystem 1200

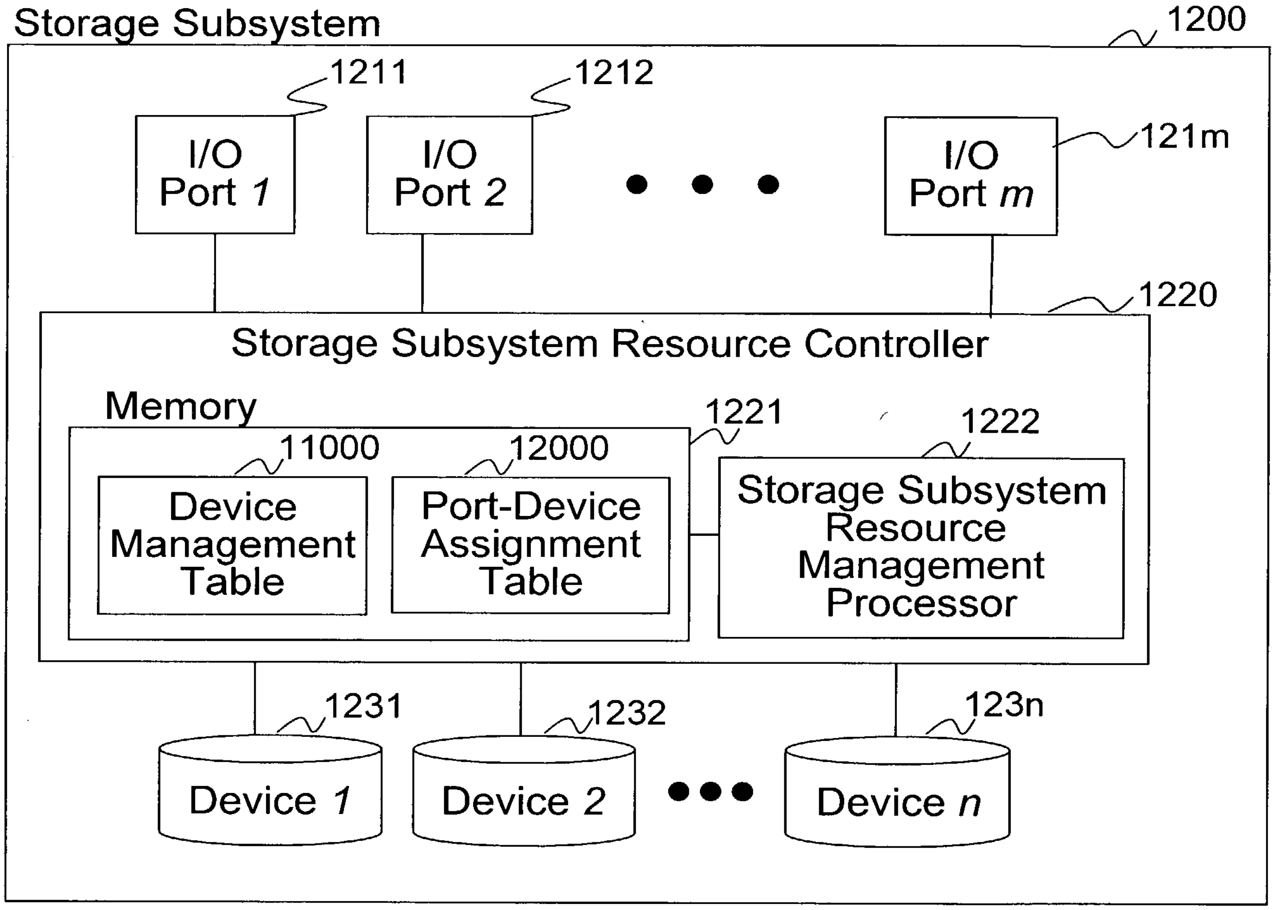

Storage Subsystem
1200
1211
1212
I/O Port 1
I/O Port 2
I/O Port m
121m
1220
Storage Subsystem Resource Controller
Memory
1221
1222
11000
12000
Device Management Table
Port-Device Assignment Table
Storage Subsystem Resource Management Processor
1231
1232
123n
Device 1
Device 2
Device n

Figure 6: General Processing Flow of SIoD Center System 1100

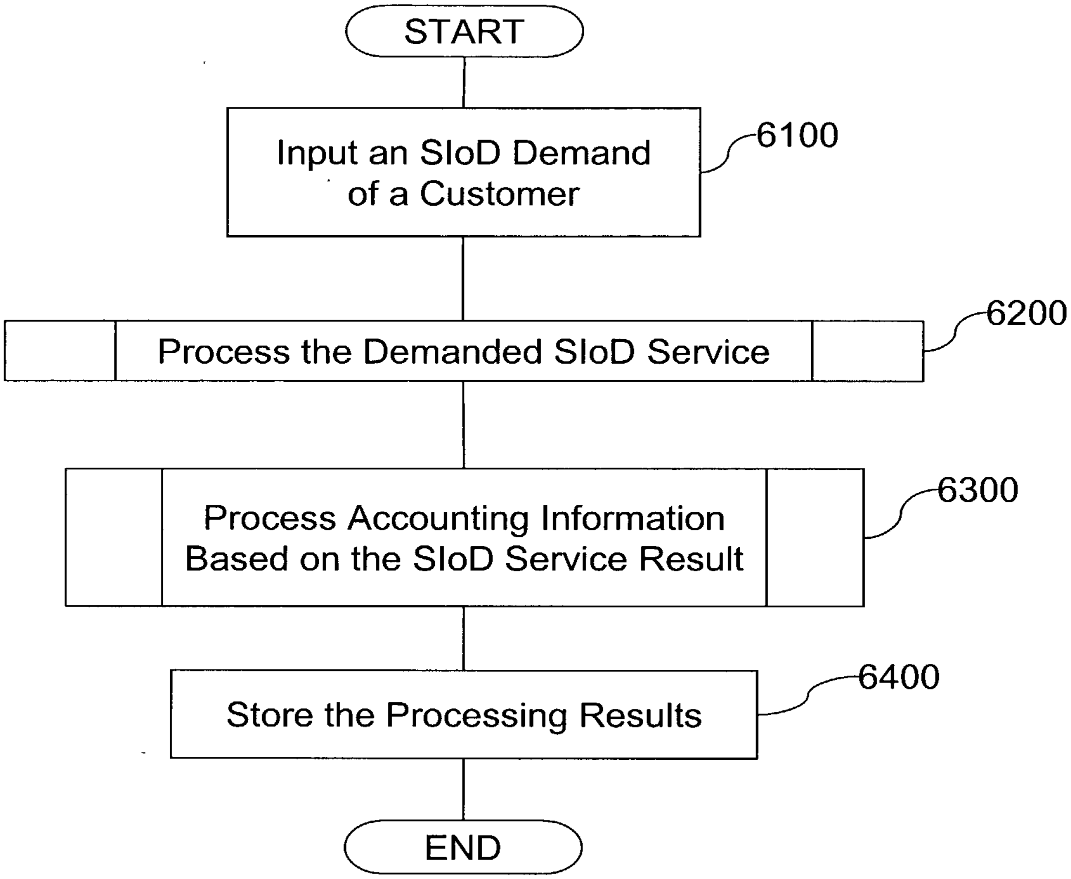
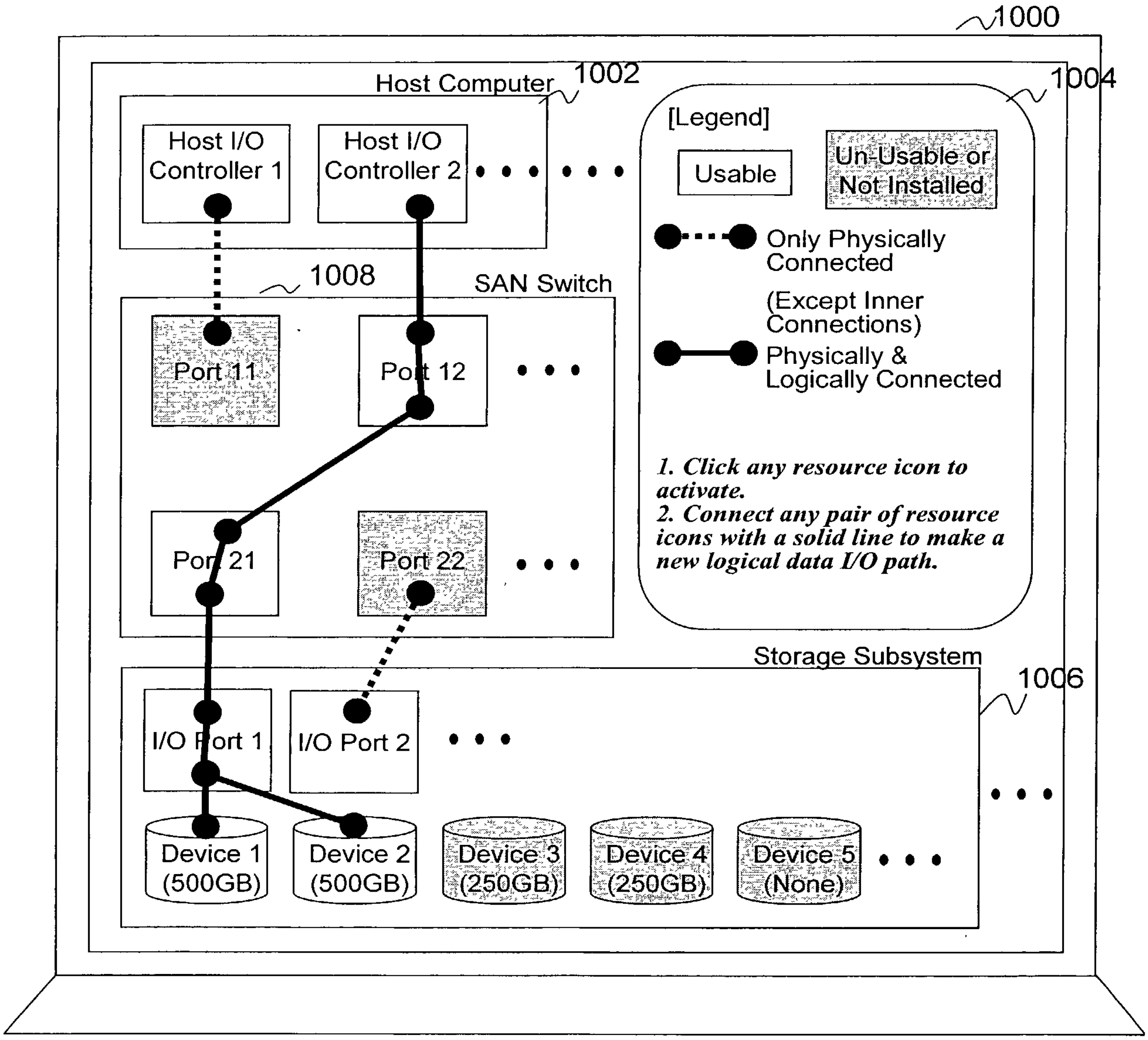
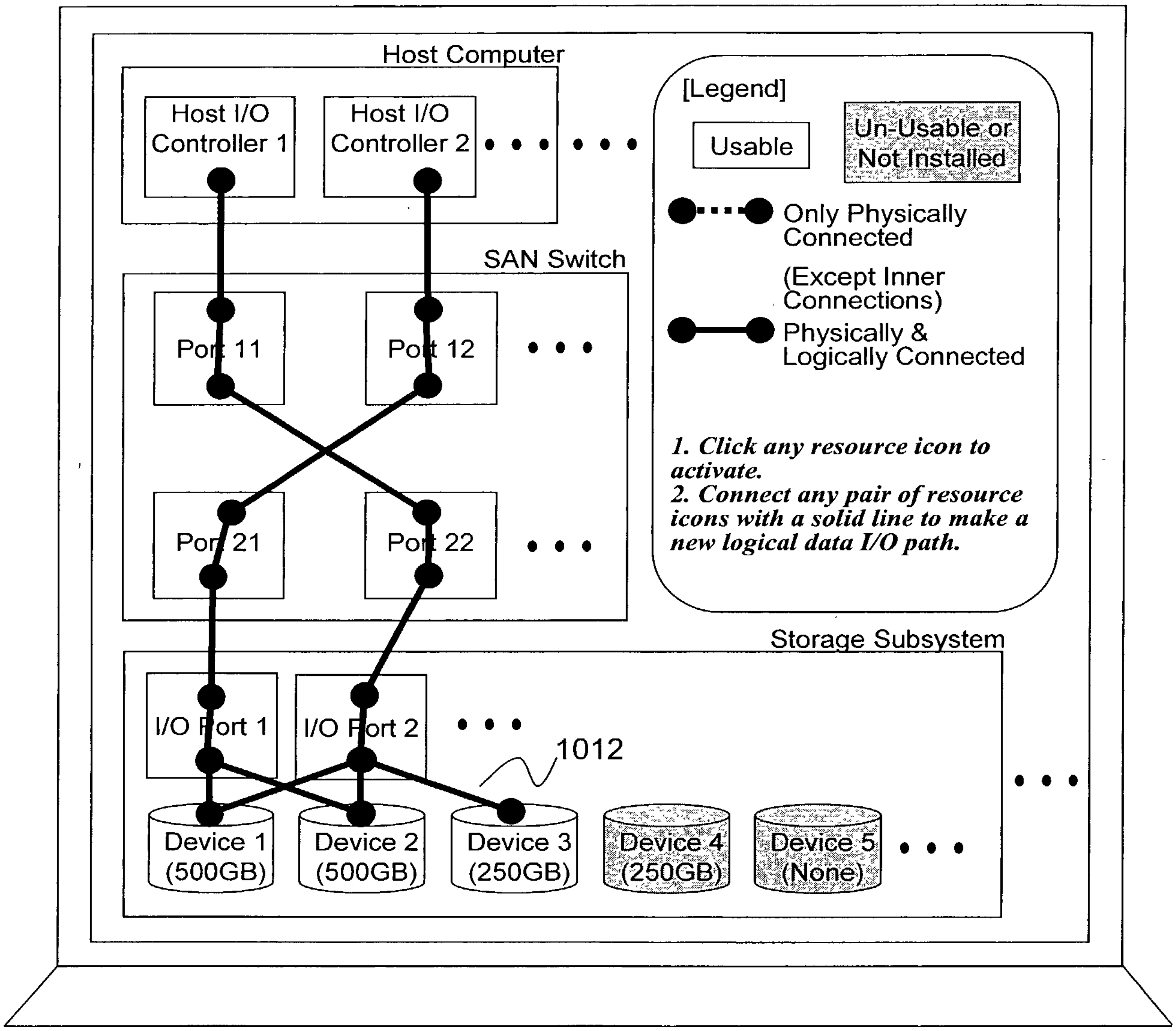

START
Input an SIoD Demand of a Customer
6100
Process the Demanded SIoD Service
6200
Process Accounting Information Based on the SIoD Service Result
6300
Store the Processing Results
6400
END

Figure 7: GUI of SIoD Demand Input
(Before SIoD)


1000
Host Computer
1002
1004
Host I/O Controller 1
Host I/O Controller 2
[Legend]
Usable
Un-Usable or Not Installed
Only Physically Connected
(Except Inner Connections)
Physically & Logically Connected
1008
SAN Switch
Port 11
Port 12
Port 21
Port 22
Storage Subsystem
1006
I/O Port 1
I/O Port 2
Device 1 (500GB)
Device 2 (500GB)
Device 3 (250GB)
Device 4 (250GB)
Device 5 (None)

***1. Click any resource icon to activate.***
***2. Connect any pair of resource icons with a solid line to make a new logical data I/O path.***

Figure 8: GUI of SIoD Demand Input
(After SIoD)


Host Computer
Host I/O Controller 1
Host I/O Controller 2
SAN Switch
Port 11
Port 12
Port 21
Port 22
Storage Subsystem
I/O Port 1
I/O Port 2
1012
Device 1 (500GB)
Device 2 (500GB)
Device 3 (250GB)
Device 4 (250GB)
Device 5 (None)
[Legend]
Usable
Un-Usable or Not Installed
Only Physically Connected
(Except Inner Connections)
Physically & Logically Connected

*1. Click any resource icon to activate.*
*2. Connect any pair of resource icons with a solid line to make a new logical data I/O path.*

Figure 9: Detailed Processing Flow of Step 6200

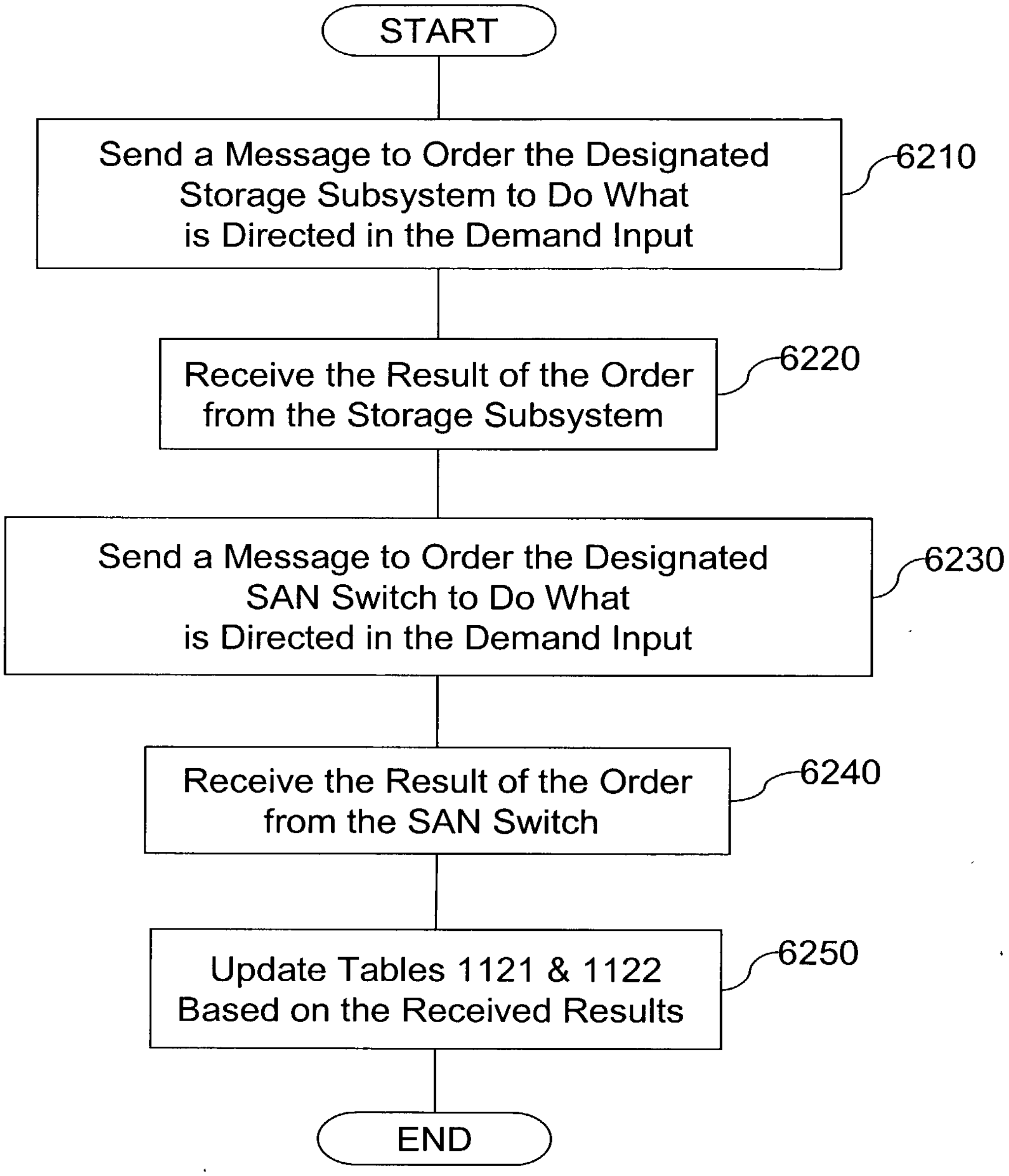
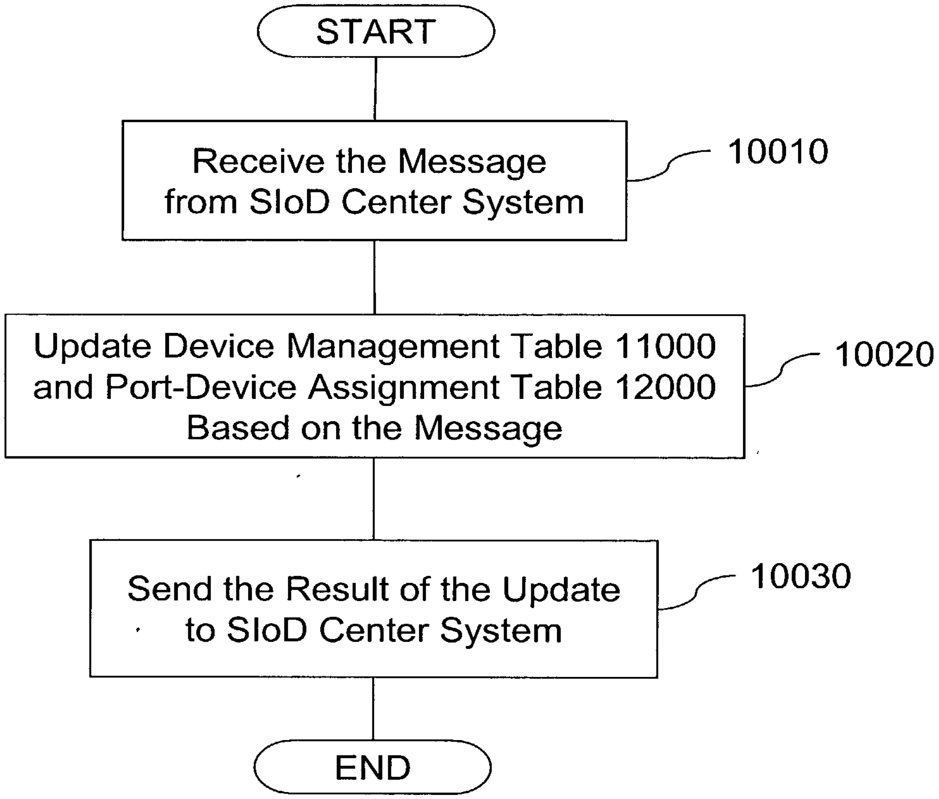

START
Send a Message to Order the Designated Storage Subsystem to Do What is Directed in the Demand Input
6210
Receive the Result of the Order from the Storage Subsystem
6220
Send a Message to Order the Designated SAN Switch to Do What is Directed in the Demand Input
6230
Receive the Result of the Order from the SAN Switch
6240
Update Tables 1121 & 1122 Based on the Received Results
6250
END

Figure 10: Processing Flow of Storage Subsystem Resource Management Processor 1222


START
Receive the Message from SIoD Center System
10010
Update Device Management Table 11000 and Port-Device Assignment Table 12000 Based on the Message
10020
Send the Result of the Update to SIoD Center System
10030
END

## Figure 11: Device Management Table 11000 (Before SIoD Demand Processing)

11010 11020 11030 11040 11050 11000

| Device No. | Customer ID | Installation Status | SoD Status | Size |
|---|---|---|---|---|
| 1 | 676851011 | Installed | Usable | 500 GB |
| 2 | 676851011 | Installed | Usable | 500 GB |
| 3 | N/A | Installed | Un-Usable | 250 GB |
| 4 | N/A | Installed | Un-Usable | 250 GB |
| 5 | N/A | Not Installed | Un-Usable | N/A |
|  |  | ⋮ |  |  |
| n | N/A | Not Installed | Un-Usable | N/A |

## Figure 12: Device-Port Assignment Table 12000 (Before SIoD Demand Processing)

12010 12020 12030 12000

| I/O Port ID | Installation Status | Device No. |
|---|---|---|
| 1211 | Installed | 1, 2 |
| 1212 | Installed | None |
| 1213 | Not Installed | N/A |
|  | ⋮ |  |
| 121m | Not Installed | N/A |

## Figure 13: Device Management Table 11000 (After SIoD Demand Processing)

11010 11020 11030 11040 11050 11000

| Device No. | Customer ID | Installation Status | SoD Status | Size |
|---|---|---|---|---|
| 1 | 676851011 | Installed | Usable | 500 GB |
| 2 | 676851011 | Installed | Usable | 500 GB |
| 3 | 676851011 | Installed | Usable | 250 GB |
| 4 | N/A | Installed | Un-Usable | 250 GB |
| 5 | N/A | Not Installed | Un-Usable | N/A |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| n | N/A | Not Installed | Un-Usable | N/A |

## Figure 14: Device-Port Assignment Table 12000 (After SIoD Demand Processing)

12010 12020 12030 12000

| I/O Port ID | Installation Status | Device No. |
|---|---|---|
| 1211 | Installed | 1, 2 |
| 1212 | Installed | 1, 2, 3 |
| 1213 | Not Installed | N/A |
| ⋮ | ⋮ | ⋮ |
| 121m | Not Installed | N/A |

Figure 15: Processing Flow of Fabric Zone Server 1730

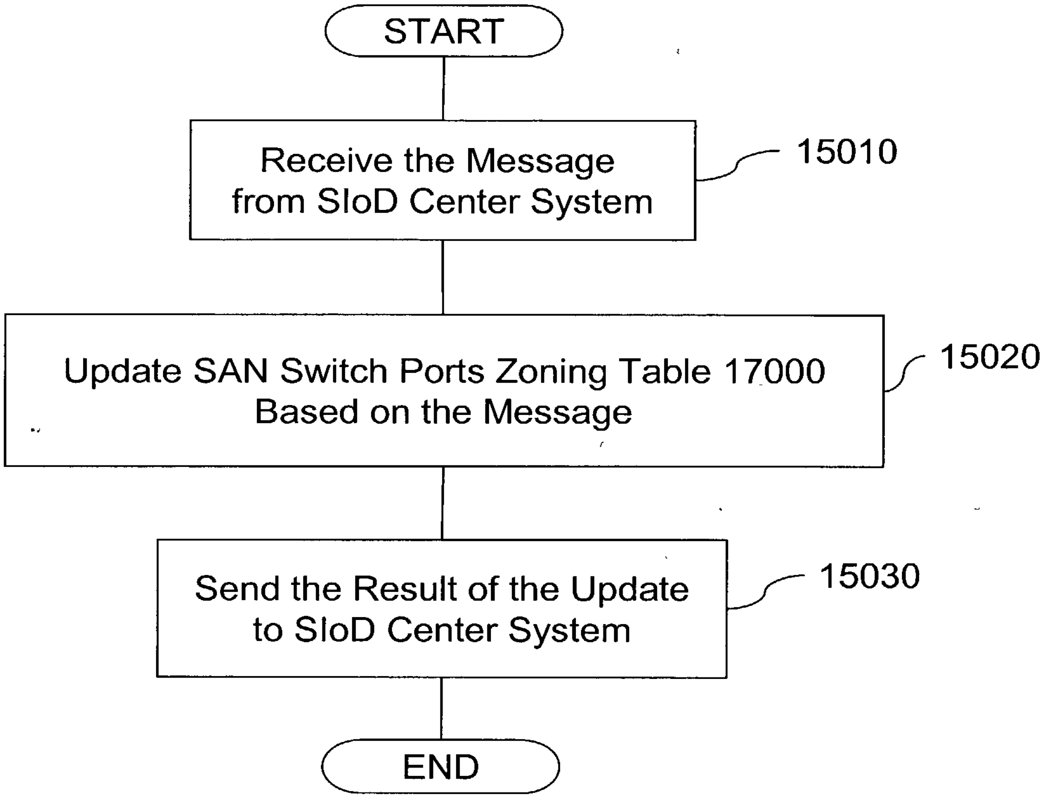

START
Receive the Message from SIoD Center System
15010
Update SAN Switch Ports Zoning Table 17000 Based on the Message
15020
Send the Result of the Update to SIoD Center System
15030
END

Figure 16: An Example of Changing Zone Setting

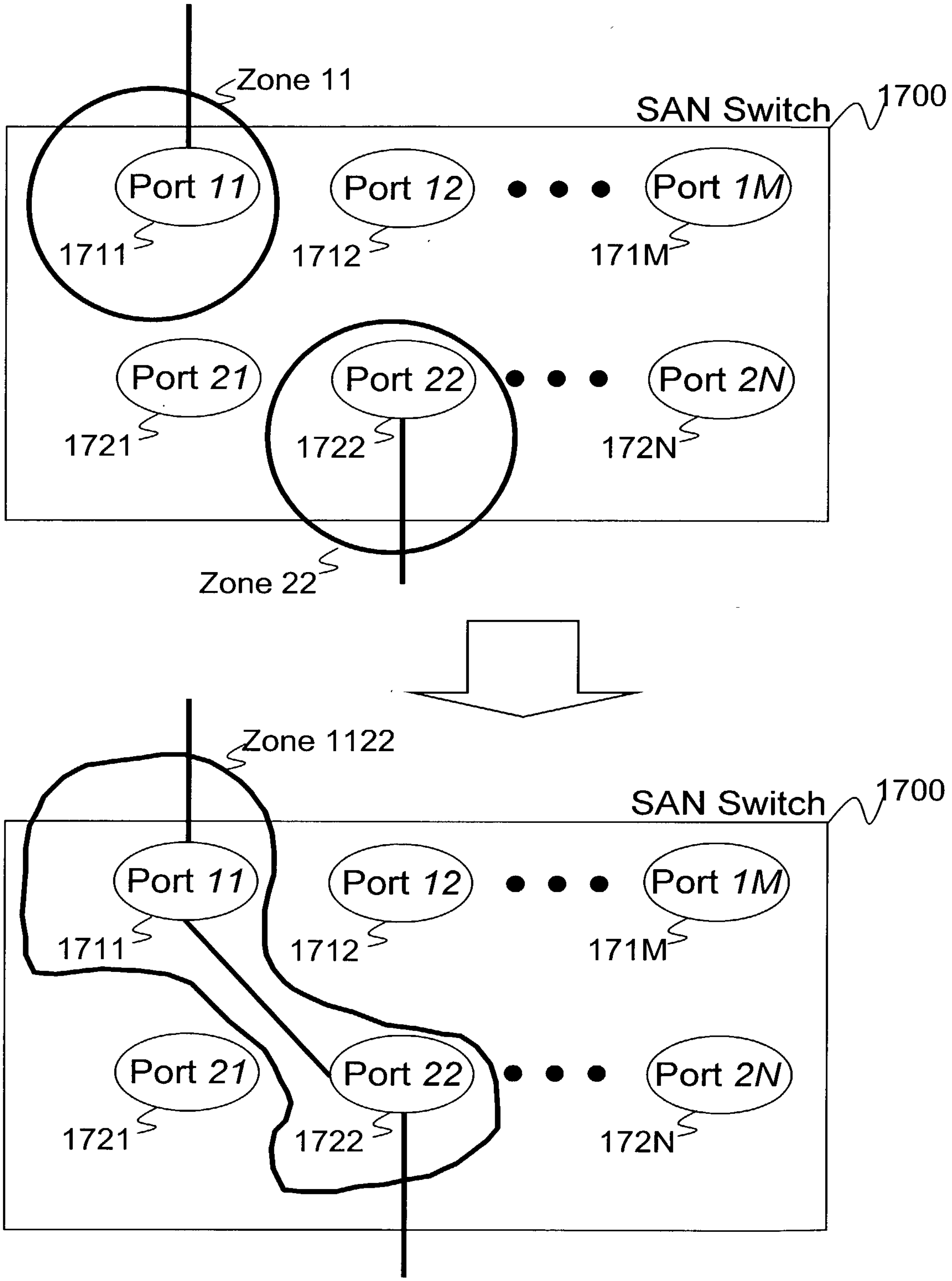

Zone 11
SAN Switch
1700
Port 11
Port 12
Port 1M
1711
1712
171M
Port 21
Port 22
Port 2N
1721
1722
172N
Zone 22
Zone 1122
SAN Switch
1700
Port 11
Port 12
Port 1M
1711
1712
171M
Port 21
Port 22
Port 2N
1721
1722
172N

Figure 17: An Example of SAN Switch Ports Zoning Table 17000 (Before SIoD Demand Processing)

17010 17020 17030 17000

| SAN Switch Port ID | Connected Device ID outside SAN Switch | Connected Ports IDs inside SAN Switch |
|---|---|---|
| 1711 | Host I/O Controller: 1431 | None (Isolated) |
| 1712 | Host I/O Controller: 1432 | 1721 |
| | • • • | |
| 1721 | I/O Port: 1211 | 1712 |
| 1722 | I/O Port: 1212 | None (Isolated) |
| | • • • | |

Figure 18: An Example of SAN Switch Ports Zoning Table 17000 (After SIoD Demand Processing)

17010 17020 17030 17000

| SAN Switch Port ID | Connected Device ID outside SAN Switch | Connected Ports IDs inside SAN Switch |
|---|---|---|
| 1711 | Host I/O Controller: 1431 | 1722 |
| 1712 | Host I/O Controller: 1432 | 1721 |
| | • • • | |
| 1721 | I/O Port: 1211 | 1712 |
| 1722 | I/O Port: 1212 | 1711 |
| | • • • | |

Figure 19: Detailed Processing Flow of Step 6300

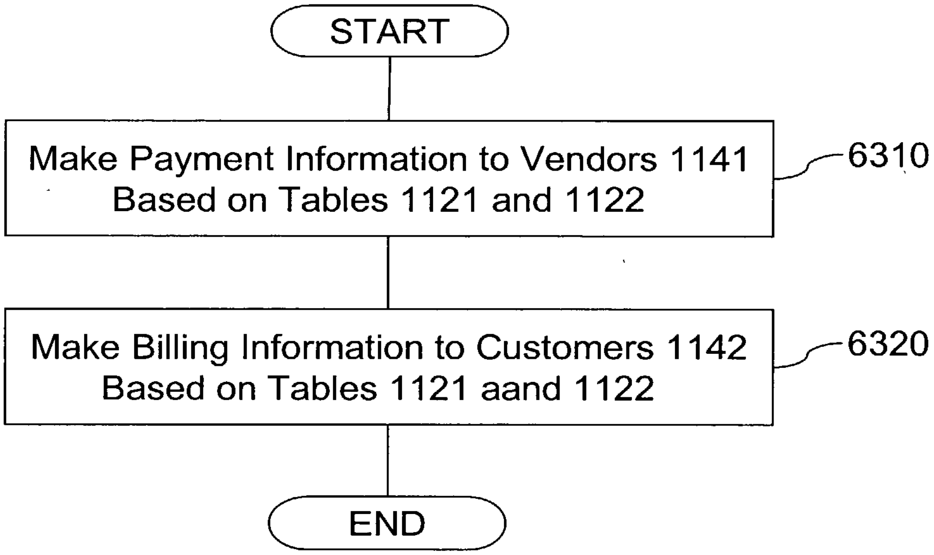
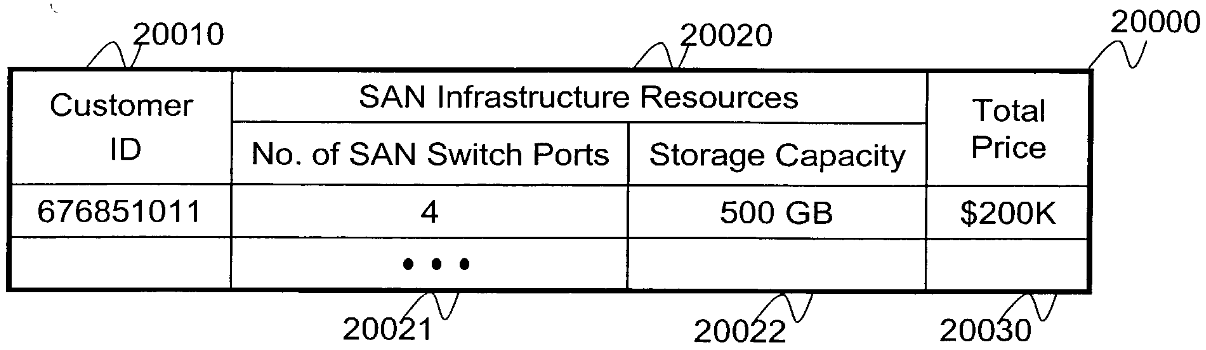
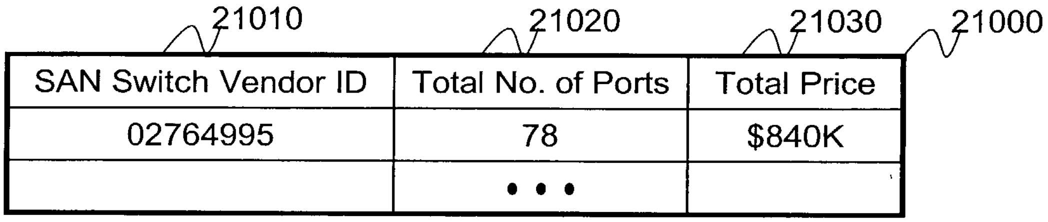

START
Make Payment Information to Vendors 1141 Based on Tables 1121 and 1122
6310
Make Billing Information to Customers 1142 Based on Tables 1121 aand 1122
6320
END

Figure 20: An Example of Billing Information to Customers


20010
20020
20000
20021
20022
20030

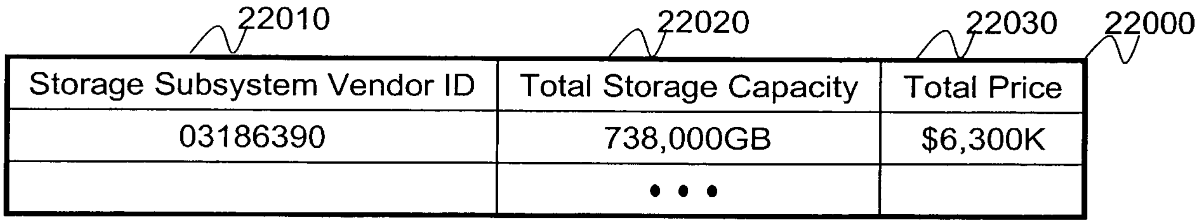
| Customer ID | SAN Infrastructure Resources | | Total Price |
|---|---|---|---|
| | No. of SAN Switch Ports | Storage Capacity | |
| 676851011 | 4 | 500 GB | $200K |
| | • • • | | |

Figure 21: An Example of Payment Information to SAN Switch Vendors


21010
21020
21030
21000

| SAN Switch Vendor ID | Total No. of Ports | Total Price |
|---|---|---|
| 02764995 | 78 | $840K |
| | • • • | |

Figure 22: An Example of Payment Information to Storage Subsystem Vendors


22010
22020
22030
22000

| Storage Subsystem Vendor ID | Total Storage Capacity | Total Price |
|---|---|---|
| 03186390 | 738,000GB | $6,300K |
| | • • • | |